THE STUDY OF WATERSHED RETENTION APPROACH TO IDENTIFY WATER RESOURCES PROBLEMS AT JOHOR WATERSHED

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Dedicated to my beloved Husband, Mother, Father, Mother in law and Father in law

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In the name of Allah, the Most Beneficent, the Most Merciful. All praise and thanks to Allah, lord of the universe and all that exists. Prayers and peace be upon His prophet Mohammad, the last messenger of all humankind.

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ABSTRACT

Rapid growth of urban area is threatening the watershed and reduces the sustainability. Since the principle of water quantity problem mitigation is to increase the capacity of available storage in the watershed, this study is done for the evaluation of watershed management using watershed retention capacity approach. The main approach of this study is the water balance. It use for use to check the reasonability data, to analyze watershed retention, and then to identify the solution for water problems. The result shows that 31% of the total becomes river discharge while 68% becomes evapotranspiration and only 1% becomes storage (groundwater). The Johor watershed retention capacity was calculated as 3885mm, and 14% of it comes from Linggui Dam, whose capacity is 760 MCM (553mm). The histogram of Johor river discharge shows that the droughts are more frequent as compared to floods. Considering the flood and drought volume it is found that the best option to mitigate such problems is by constructing a dam/reservoir. When install the reservoir with about 1462 MCM (with storage depth of 1064 mm), the river discharge become the moving average. This project can stop the floods, but only reduce the drought into 7% frequency. Different scenarios of water management were conducted to mitigate flood and drought completely. However no scenario has lower than 1064 mm of reservoir capacity. Therefore, a reservoir with capacity of 1796 mm (2468 MCM) is considered as better option since the capacity is minimum in order to fulfil the Johor watershed requirements as well as the water requirements of Singapore. The minimum discharge for this option is $21m^3/s$ while maximum discharge is $50m^3/s$.

ABSTRAK

Pertumbuhan pesat kawasan bandar mengancam kawasan tadahan dan mengurangkan kemampanan. Sejak prinsip mitigasi masalah kuantiti air adalah untuk meningkatkan kapasiti penyimpanan yang ada di kawasan tadahan, kajian ini dilakukan untuk penilaian pengurusan kawasan tadahan air menggunakan kapasiti pengekalan pendekatan tadahan. Pendekatan utama kajian ini adalah keseimbangan air. Ia gunakan untuk digunakan untuk memeriksa data reasonability, untuk menganalisis pengekalan kawasan tadahan air, dan kemudian untuk mengenal pasti penyelesaian untuk masalah air. Hasilnya menunjukkan bahawa 31% daripada jumlah keseluruhan menjadi pelepasan sungai manakala 68% menjadi evapotranspirasi dan hanya 1% menjadi penyimpanan (bawah tanah). Kawasan tadahan Johor pengekalan kapasiti dalam takungan telah dikira sebagai 3885mm, dan 14% daripada ia datang dari Linggui Empangan, yang kapasiti adalah 760 MCM (553mm). Histogram pelepasan Johor sungai menunjukkan bahawa kemarau adalah lebih kerap berbanding banjir. Memandangkan banjir dan jumlah kemarau ia mendapati bahawa pilihan terbaik untuk mengurangkan masalah tersebut adalah dengan membina sebuah empangan / takungan. Apabila memasang takungan dengan kira-kira 1462 MCM (dengan kedalaman penyimpanan 1064 mm, menunaikan sungai menjadi purata bergerak. Projek ini boleh menghentikan banjir, tetapi hanya mengurangkan kemarau ke frekuensi 7%. Senario berbeza pengurusan air telah dijalankan untuk mengurangkan banjir dan kemarau sepenuhnya. Walau bagaimanapun, senario tidak mempunyai lebih rendah daripada 1064 mm kapasiti takungan. Oleh itu, satu takungan dengan kapasiti 1796 mm (2468 MCM) dianggap sebagai pilihan yang lebih baik kerana ia boleh memenuhi keperluan kawasan tadahan Johor serta keperluan air Singapura. pembuangan minimum untuk pilihan ini adalah 21m^3 / s manakala pelepasan maksimum adalah 50m^3 / s.